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Neotectonic Characteristics of Central Anatolia[1]

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Abstract

The Central Anatolian Crystalline Complex and its Tertiary cover have been highly dissected by neotectonic structures. The period of neotectonic activity is dominated by three main fault systems in Central Anatolia—the Tuzgölü fault zone, the Ecemis fault zone, and the Yozgat-Akdagmadeni-Bogazliyan fault system. The Tuzgölü fault zone, trending in a NW-SE direction, is located WSW of the Central Anatolian Crystalline Complex (CACC). This fault zone consists of parallel to subparallel, normal, and oblique right-lateral strike-slip faults displaying a step-like half-graben and horst-graben pattern. It controls the eastern margin of Tuzgölü, fault-parallel depressions, and the western margin of the Central Anatolian volcanic province. The Ecemis fault zone is located east of the CACC and is characterized by NE-SW–trending, left-lateral strike-slip faults controlling the eastern margin of the Central Anatolian volcanic province. The Yozgat-Akdagmadeni-Bogazliyan region is dominated by NW-SE– and NE-SW–trending conjugate faults. These three fault systems control the widely distributed Plio-Quaternary depressions, calcalkaline-alkaline volcanic activity, and deposition of talus, alluvial fan, travertine, and terrace deposits. Alignment of hot springs, cinder cones, drainage offsets, and linear valleys are the characteristic features of strike-slip fault patterns observed in the region. Both morphotectonic features and recent earthquakes strongly suggest that most of the segments of these fault zones are still active.

Introduction

THE STUDY AREA is located in the central part of Turkey and is bounded by the Tuzgölü and Haymana basins on the west, the Sivas basin on the east, the Ulukisla basin on the south, and the Tokat metamorphic complex on the north (Fig. 1). Beginning in the 1990s, detailed geologic studies and mapping were completed in the region by a Middle East Technical University team (Göncüoglu et al., 1991, 1992, 1993, 1994; Göncüoglu, 1992; Cemen and Dirik, 1992). During these studies, it was recognized that the Neogene–Quaternary cover of the Central Anatolian Crystalline Complex (CACC) was deposited in three groups of basins. The first group is represented by NW-SE–oriented middle Miocene molasse basins that are dominated by approximately NW-SE– and WNW-ESE–trending fold axes. According to the orientation of these structures, the most recent shortening direction was NNE-SSW in Central Anatolia. The second group is represented by NNW-SSE– and NE-SW–trending uppermost Miocene–Pliocene basins, bounded by oblique-slip or normal faults. Plio-Quaternary basins of the Ecemis fault zone constitute the third group of basins.

During these studies it also was observed that volcanism, most of the Plio-Quaternary basins-depressions, and the recent morphology of the region all have been controlled by strike-slip, normal, and oblique-slip faults of the neotectonic period. The Neogene–Quaternary volcanism of Central Anatolia and some of the neotectonic faults and depressions of the southern part of the region (Central Anatolian volcanic province) have been studied and reported upon by different authors (Innocenti et al., 1975; Pasquare et al., 1988; Ercan et al., 1990; Göncüoglu and Toprak, 1992; Toprak and Göncüoglu, 1993a, 1993b; Toprak, 1994; Toprak and Kaymakci, 1995). The main purpose of this paper is to outline the general neotectonic characteristics of Central Anatolia on the basis of recent field studies, and to discuss the seismicity of the region.

Stratigraphy

The rock units exposed in the region are divided into basement rocks and a cover

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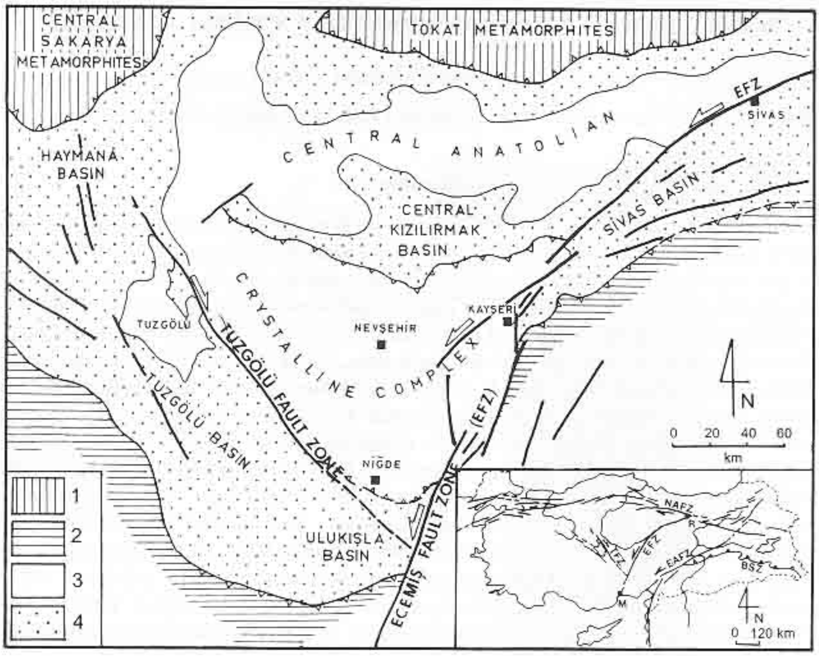

FIG. 1. Simplified tectonic map showing the location of the study area and tectonic units of Central Anatolia (modified from Göncüoglu et al., 1994). Legend: 1 = Pre-Tertiary basement of the Sakarya microcontinent; 2 = Pre-Tertiary basement of the Tauride-Anatolide platform; 3 = Central Anatolian Crystalline Complex; 4 = Tertiary deposits.

sequence. The rock units older than late Miocene are considered to be the basement rocks, and their uppermost Miocene–Quaternary cover is considered to be the cover sequence in this study (Fig. 2).

Basement rocks

The basement rocks of the study area consist of the Central Anatolian Crystalline Complex and its Lower Tertiary cover. Since discussion of the basement rocks lies beyond the scope of the present paper, this section provides only a general description of these rocks. The CACC is the oldest basement rock unit and it consists of Paleozoic–Mesozoic Central Anatolian metamorphics, Upper Cretaceous Central Anatolian ophiolites, and Upper Cretaceous–Paleocene Central Anatolian granitoids (Göncüoglu et al., 1992, 1993, 1994). The Central Anatolian Crystalline Complex is covered by sediments of the Tertiary basins, which formed in this complex as a result of post-collisional collapse during Late Cretaceous–Early Paleocene time (Göncüoglu et al. 1994, 1995). The geological units of this period are characterized by olistostromes with blocks of alkaline/calcalkaline magmatic rocks, metamorphics, and ophiolites. The Eocene sequences are represented by shallow- to deep-marine sediments. The presence of blocks and large olistoliths of older rocks, megaslumps in the distal parts of the basins and northward, and thrust slices of the Central Anatolian Crystalline Complex reflect a compressional regime, which resulted in development of northward-dipping and/or tilted foreland basins. These basins later were filled with evaporite- and coal-bearing middle Miocene continental clastics of the Gümüsyazi Group (Göncüoglu et al. 1993; Funda et al., 1995) and then deformed by NNW-SSE–trending shortening before the latest Miocene (Göncüoglu et al., 1994).

Cover sequence

The cover sequence consists of upper Miocene–Pliocene (Kizilirmak Group) and Plio-Quaternary fluvial-lacustrine units that are deposited mostly in normal-, oblique-, and

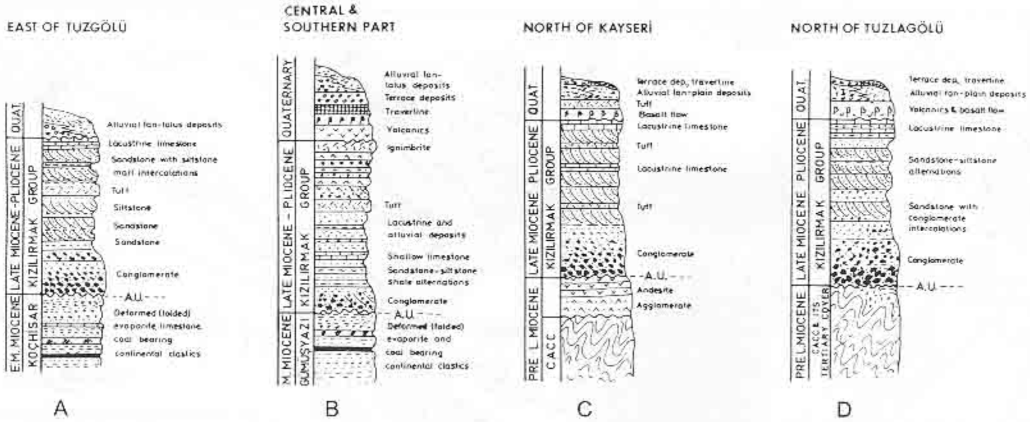

FIG. 2. Generalized columnar sections of the cover sequence from four different regions of Central Anatolia (not to scale). Abbreviations: A.U. = angular unconformity.

strike-slip-fault–controlled basins and are intercalated with volcanic-volcanosedimentary rocks. This sequence unconformably overlies the basement rocks and covers the structures of the paleotectonic period. The cover sequence shows strong lateral and vertical facies changes from west to east (Fig. 2).

East of Tuzgölü, the lower part of the sequence is represented by polygenic, poorly sorted, semi-consolidated, thick- to medium-bedded conglomerate. Upward, the sequence grades into fine-grained, well-sorted, cross-bedded, thin- to medium-bedded sandstone with siltstone and conglomerate intercalations, followed by thin (1- to 9-m-thick) but continuous tuffaceous strata. The sequence is overlain by medium- to thick-bedded, cross-bedded sandstone with thin siltstone, marl intercalations, and white to yellow clayey limestone. The alluvial fan–talus deposits, alluvial deposits, and terrace deposits constitute the youngest unit of this sequence (Fig. 2A). These units constitute the fault-controlled western marginal facies of the Tuzgölü basin. Therefore, the deposition of these units was controlled by NW-SE–trending faults of the Tuzgölü fault zone (Göncüoglu et al. 1993; Toprak and Göncüoglu, 1993a) (see Fig. 4).

In the central and eastern part of the region, the cover sequence is characterized by a thick succession of pyroclastic rocks of the Central Anatolian volcanic province and lacustrine-alluvial deposits. The sequence is represented by cross-bedded conglomerate and sandstone-siltstone-shale alternation at the base, and it grades upward to lacustrine and fluvial deposits intercalated with ignimbrites, tuffs, and calc-alkaline-alkaline volcanics (Pasquare et al., 1988; Ercan et al., 1990). According to radiometric dating (Innocenti et al., 1975; Besang et al., 1977; Batum, 1978), the age of this unit is 4.4 to 5.5 Ma and the age of the sedimentary units intercalated with the ignimbrites is Pontian (Senyürek, 1953; Sassano, 1964; Beekman, 1966; Pasquare, 1968). Therefore the age of this unit is accepted as late Miocene–Pliocene. This sequence is overlain by Quaternary volcanics, terrace deposits, travertine, and alluvial fan and talus deposits (Figs. 2B, 2C, and 2D). Elevated terrace deposits are observed extensively along the channel of the Kizilirmak River and in association with faults. Talus deposits are formed along the steep slopes of the footwall, whereas fan deposits are observed extensively on downthrown fault blocks. Thick alluvial fan deposits that are represented by subrounded, unsorted, weakly consolidated conglomerates also constitute the marginal facies of fault-controlled Quaternary basins such as the Derinkuyu, Sultansazligi, and Tuzla gölü. These basins have been superimposed on the upper Miocene–Pliocene sediments and volcanic rocks.

Geologic Structures

In the study area, both paleotectonic structures and neotectonic structures are clearly

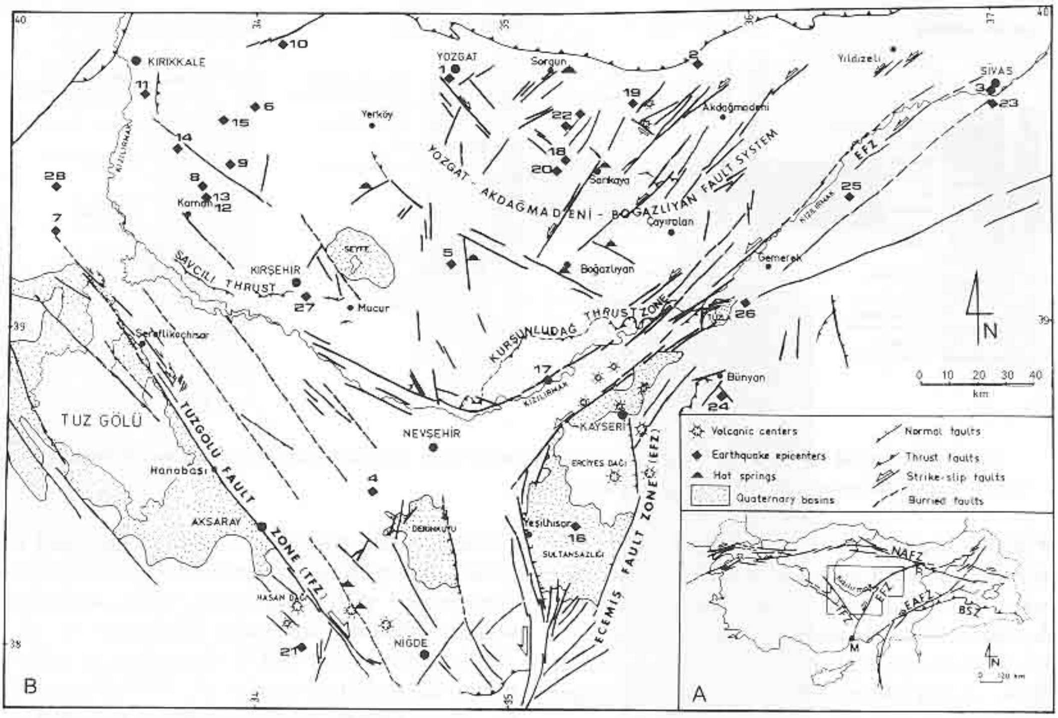

FIG. 3. A. Simplified neotectonic map of Turkey showing the location of the study area. Abbreviations: NAFZ = North Anatolian fault zone; TFZ = Tuzgölü fault zone; EFZ = Ecemis fault zone; EAFZ = East Anatolian fault zone; BSZ = Bitlis suture zone; M = Mersin; R = Refahiye. B. Neotectonic and seismic map of Central Anatolia (numbers next to earthquake epicenters refer to the number of events listed in Table 1).

evident. The Kursunludag thrust zone, Savcili thrust, Bünyan thrust (Fig. 3B), and asymmetric overturned folds within Tertiary basins of the CACC are important paleotectonic structures.[2] The recent morphology of Central Anatolia has been shaped by important fault zones and systems—namely, the Tuzgölü fault zone, Ecemis fault zone, and Yozgat-Akdagmadeni-Bogazliyan fault system (Fig. 3B). Although the nature of these fault zones before the middle Miocene currently is the subject of much debate, they behave as active strike-slip faults at present. In the region, there also are some buried fault systems developed within the rocks of Mio-Pliocene age, controlling the margins of the Mio-Pliocene depressions. These faults are covered by later volcaniclastic and fluvial rocks of Plio-Quaternary age, and therefore are not active at present. Some of these faults extend parallel to the Tuzgölü fault zone (Toprak and Göncüoglu, 1993a) and the Ecemis fault zone (Fig. 3B).

[2]Since discussion of structures of the paleotectonic period lies beyond the scope of this paper, these structures will not be addressed here.

Tuzgölü fault zone (TFZ)

The Tuzgölü fault zone is a NW-SE–trending intracontinental fracture zone, approximately 190 to 200 km long and 5 to 25 km wide, extending from north of Tuzgölü to south of Nigde (Fig. 3). It consists mostly of parallel to subparallel faults trending from 130° to 160° and displaying step-like half-graben and horst-graben fault patterns (Fig. 4). Different local names have been assigned to this fracture zone and its segments in earlier studies—e.g., the Kochisar-Aksaray fault (Uygun, 1981; Görür et al, 1984; Atabey et al. 1987), the Hasandag fault set (Göncüoglu et al., 1991), the Kochisar fault set (Cemen and Dirik, 1992), and the Salt Lake fault set (Kocyigit, 1991). The TFZ controls the eastern margin of Tuzgölü and displays an

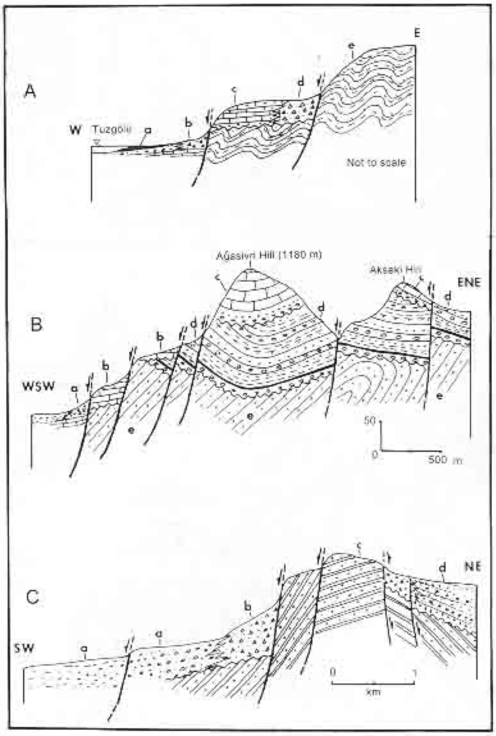

FIG. 4. Geologic cross-sections depicting the normal-fault character of the Tuzgölü fault zone and boundary relationships between different units. A. a = recent evaporites of Tuzgölü; b = Quaternary alluvial fan–talus deposits; c = Plio-Quaternary lacustrine deposits; d = Plio-Quaternary alluvial fan–talus deposits; e = thin-bedded and intensely folded gypsum-bearing levels of the Kochisar Formation (northeastern tip of Tuzgölü). B. a = Quaternary alluvial fan–talus deposits; b = Plio-Quaternary lacustrine deposits; c = Upper Miocene–Pliocene lacustrine deposits (uppermost levels of the Kizilirmak Group); d = coal-bearing clastic deposits of the lower middle Miocene Kochisar Formation; e = overturned Eocene clastic sequence (2 km north of Sereflikochisar). C. a = Quaternary alluvium; b = Quaternary alluvial fan–talus deposits; c = uppermost Maastrichtian clasics; d = upper Miocene–Pliocene clastics of the Kizilirmak Group.

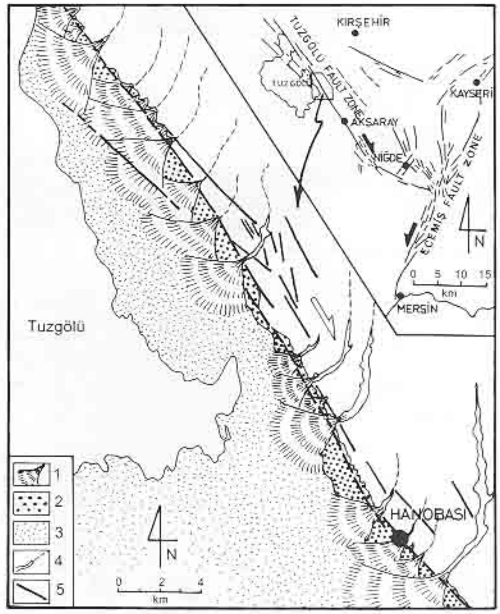

FIG. 5. Alignment of alluvial fans and clockwise bending of streams to the north of Hanobasi, suggesting a right-lateral (dextral) movement along the Tuzgölü fault zone. Legend: 1 = alluvial fan; 2 = alluvial apron to talus; 3 = alluvium; 4 = stream channel; 5 = faults.

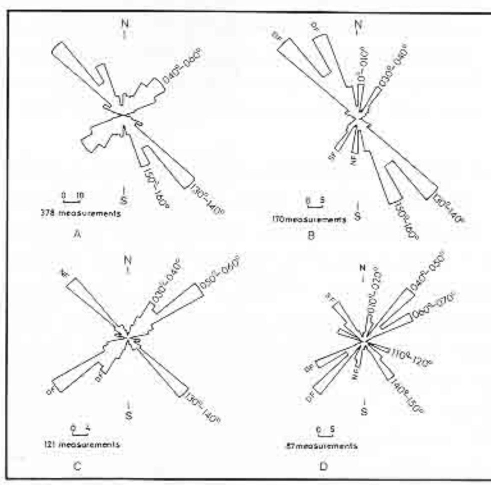

FIG. 6. Rose diagrams of the normal and strike-slip fault trends from three different regions of Central Anatolia. A. Overall pattern. B. Tuzgölü fault zone. C. Ecemis fault zone. D. Yozgat-Akdagmadeni-Bogazliyan fault system. Abbreviations: NF = normal faults; DF = right-lateral strike-slip (dextral) faults; SF = left-lateral strike-slip (sinistral) faults (from Göncüoglu et al., 1991, 1992, 1993, 1994; Cemen and Dirik, 1992).

en echelon pattern. Alignment of very thick alluvial fans along the western downthrown block of the TFZ, elevated Plio-Quaternary deposits of the Tuzgölü basin (Fig. 4), and the clockwise bending of streams on the footwall between Sereflikochisar and Aksaray (Fig. 5) are important characteristic features of this fault zone. The southern segment of the TFZ is characterized by volcanic activity, alignment of

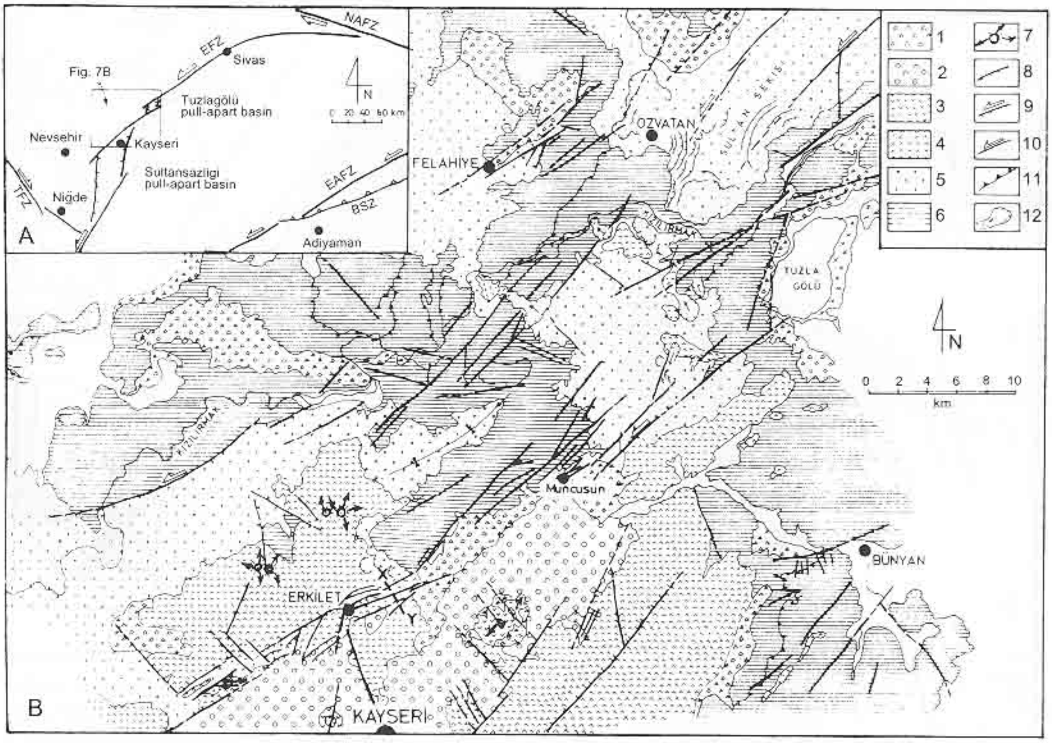

FIG. 7. A. Location map of Figure 7B. Abbreviations: NAFZ = North Anatolian fault zone; TFZ = Tuzgölü fault zone; EFZ = Ecemis fault zone; EAFZ = East Anatolian fault zone; BSZ = Bitlis suture zone. B. Geologic map of the eastern part (Kayseri-Felahiye-Bünyan) of the study area. Legend: 1 = alluvial fan–talus deposits; 2 = Quaternary deposits of Sultansazligi pull-apart basin; 3 = Quaternary volcanics; 4 = Plio-Quaternary volcanics; 5 = uppermost Miocene–Pliocene deposits and volcanics; 6 = basement rocks; 7 = volcanic centers; 8 = normal fault; 9 = strike-slip fault with vertical component; 10 = strike-slip fault; 11 = thrust fault; 12 = landslides.

hot springs, alignment of cinder cones parallel to the fault traces, right-lateral offset of lava flows, striated surfaces, travertine occurrences, and fault-controlled terrace deposits (Toprak and Göncüoglu, 1993b). The Quaternary Hasandag composite volcano and late Miocene–Early Pliocene Keciboyduran and Melendiz composite volcanos have been developed along the TFZ at intersections with NE-SW–trending faults (Pasquare et al., 1988; Toprak and Göncüoglu, 1993b). The fault sets also cut and deform Quaternary alluvial-fan deposits and cinder cones. The northern segment of the TFZ has a steeply westward-dipping normal-fault character (Fig. 4); however, the clockwise bending of streams, right-lateral offset of volcanic rocks and features, and striated surfaces indicating right-lateral movement provide evidence of the right-lateral (dextral) strike-slip fault character of the southern segment of the TFZ.

Ecemis fault zone (EFZ)

A NE-SW–trending normal-oblique left-lateral (sinistral) strike-slip fault zone, approximately 2 to 15 km wide, is located east of the CACC (Fig. 1). This zone is one of the major structures of Turkey, extending from Mersin on the southwest to Sivas-Refahiye on the northeast (Figs. 1 and 3A). This intracontinental fracture zone has been called the Ecemis Corridor by Blumenthal (1941, 1952), the Tekir Dislocation by Metz (1956), the Ecemis fault by Ketin (1960), the Ecemis Transcurrent Fault by Pavoni (1961), the Ecemis fault zone by Yetis (1978), and the Pozanti-Kayseri fault by Scott (1981). The EFZ is dominated by a series of NE-SW–trending (Fig. 6) parallel to subparallel

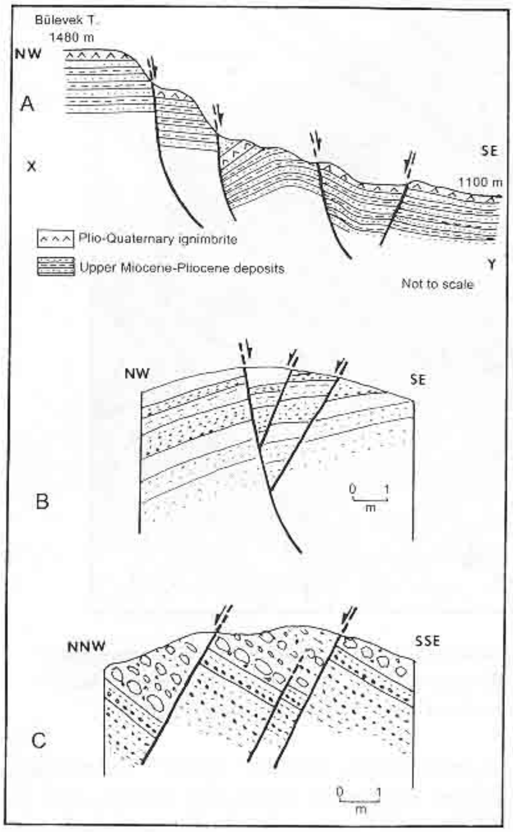

FIG. 8. Geological cross-sections depicting the character of the Ecemis fault zone in the Sultansazligi pull-apart basin between Erkilet and west of Tuzlagölü. A. Listric faults from east of Erkilet (along X–Y in Figure 7). B. Small-scale listric and antithetic faults within upper Miocene–Pliocene clastics (2 km north of Muncusun). C. Domino structure within the volcaniclastics of upper Miocene–Pliocene deposits (10 km north of Muncusun).

faults displaying very characteristic strike-slip fault patterns along the fault zone, such as horsetail, left- and right-stepping, en echelon, relay, and anastomosing patterns. In the southern part of the study area, the EFZ displays a horsetail pattern, and with left stepping it jumps to the north of Yesilhisar (Fig. 3B). This left stepping along the course of the EFZ has developed an important rhomboid-shaped tectonic depression—the Sultansazligi pull-apart basin (Figs. 3B and 7A). The EFZ displays quite characteristic morphotectonic features between Kayseri and Tuzlagölü (Fig. 7). Juxtaposition of uppermost Miocene–Pliocene deposits and Quaternary deposits, and the presence of active landslides, fault scarps, step-faulted lava flows, and very thick and tilted alluvial fans, are quite distinctive along this segment of the EFZ (Figs. 7 and 8). Erciyesdagi, the largest composite central volcano of Cappadocia (Fig. 3), and other volcanic eruptions along NW-SE–trending fractures (Fig. 7B) are important features of this basin. Along the northern, active margin of the basin, the northern block has been uplifted up to 380 m (Fig. 8). Therefore, the magnitude of subsidence caused by the Sultansazligi basin along its northern border fault since the initiation of the basin is estimated as 380 m.

Southwest of Tuzlagölü, the EFZ jumps again to the north, with left stepping, and a second pull-apart basin has developed as a result. Starting north of Tuzlagölü, the EFZ runs to Sivas by following a strike of 045° to 055°; it consists of approximately 50-km-long, parallel to subparallel faults controlling the channel of the Kizilirmak River (Fig. 3). This segment of the EFZ has been named the Kizilirmak fault zone by Inan (1993). Fault scarps, offset drainage channels, linear valleys, sag ponds, shutter ridges, elongated hills, active landslides, travertine occurrences, and alignment of springs and alluvial fans are important morphologic features of this segment of the EFZ (Inan, 1993). Formation of pull-apart basins, bending of streams, and quite characteristic patterns provide evidence of left-lateral movement along the EFZ. The upbulge area and an approximately E-W–oriented thrust fault along which basement rocks have been thrust to the south over Miocene volcaniclastics of the Ulukisla basin southwest of Nigde (Figs. 1 and 3B) (Kuscu et al., 1993) provide additional evidence of left-lateral movement along the EFZ.

Yozgat-Akdagmadeni-Bogazliyan fault system

This fault system, located in the northern and northeastern portion of the study area (Fig. 3B), consists of conjugate faults trending from 040° to 070° and 140° to 150° (Figs. 6D and 9). This fault system has been developed mostly in the Central Anatolian Crystalline Complex. However, fault-parallel depressions are located on the downthrown blocks of reactivated faults, such as Sarikaya, Cayiralan, and Sizir depressions (Fig. 9). The marginal facies of these depressions are characterized by very thick

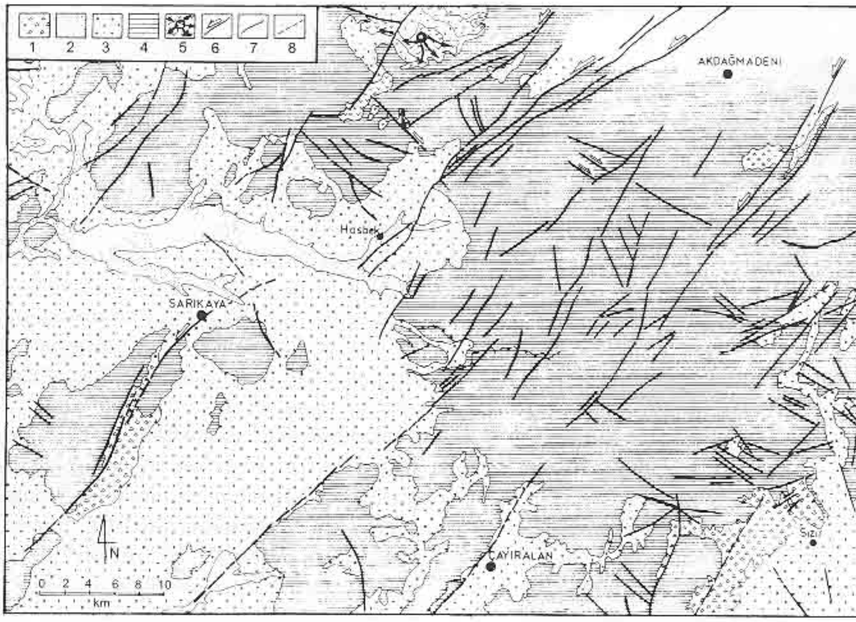

FIG. 9. Neotectonic map of the northwestern part (Akdagmadeni-Cayiralan-Sarikaya) of the study area. Legend: 1 = talus and alluvial fan; 2 = alluvium; 3 = uppermost Miocene–Pliocene deposits; 4 = basement rocks; 5 = Quaternary volcanic centers; 6 = strike-slip faults; 7 = faults of unknown character; 8 = buried faults.

alluvial fan–talus deposits. Linear valleys, en echelon patterns, small sinistral offsets along the NE-SW-trending faults, Quaternary volcanism at the intersection of conjugate faults at the northern part of the region (Fig. 9), and hot springs that are located on the faults (Sorgun, Bogazliyan, Sarikaya in Fig. 3B) all are characteristic features of this fault system.

Interpretation of faults

Figure 6A is a rose diagram prepared on the basis of trends of small- and large-scale normal and strike-slip faults exposed in Central Anatolia. According to this diagram, faults occur in three dominant directions—(1) 040° to 060°, (2) 130° to 140°, and (3) 150° to 160°. This diagram does not reflect the pure strike-slip fault pattern of Wilcox et al. (1973) and Biddle and Christie-Blick (1985), indicating that stress directions are not uniform throughout Central Anatolia. Therefore, trends of faults in these three regions have been plotted separately (Figs. 6B, 6C, and 6D).

As shown by the rose diagram of the faults observed in the Tuzgölü fault zone, faults occur in three dominant directions: (1) 0° to 010° (normal faults), (2) 030° to 040° (normal and oblique left-lateral strike-slip faults), and (3) 130° to 160° (normal and oblique right-lateral strike-slip faults) (Fig. 6B). The variation of directions between 130° and 160° is based mainly on the curved pattern of the TFZ; in its northern segment, the dominating direction is 130° to 140°, whereas in the south, the strike-slip faults trend mainly 150° to 160°. This structural pattern reveals compressive stress oriented approximately at 010° in the western part of Central Anatolia.

Figure 6C is a rose diagram of large-scale faults exposed in Figure 7B and small-scale faults of the Sultansazligi depression. This rose diagram shows three dominant directions: (1) 030° to 040°, (2) 050° to 060° (left-lateral strike-slip faults with a normal slip component), and (3) 130° to 140° (normal faults). This rose diagram reveals the presence of a local extension oriented at 040° in the eastern part of Central Anatolia.

As seen in the rose diagram of the fault traces observed in the Yozgat-Akdagmadeni-Bogazliyan fault system, faults occur in four dominant directions: (1) 010° to 020° (normal

TABLE 1. Epicenters of Earthquakes of a Magnitude of 4.2 or Greater, Central Anatolia, 1903–1986[1]

No.	Date[2]	N. Lat., degrees	E. Long., degrees	Depth, km	Magnitude[3]	Location
1	2.08.1903	39.80	34.80	–	4.3	Yozgat
2	28.05.1914	39.84	35.80	10	5.4	North of Akdagmadeni
3	1917	39.75	37.00	–	5.1	North of Tuzgölü
4	29.12.1926	38.50	34.50	–	4.3	Northwest of Derinkuyu
5	5.07.1928	39.20	34.80	–	4.5	West of Bogazliyan
6	9.04.1930	39.70	34.00	–	5.0	Southwest of Kirikkale
7	28.06.1933	39.30	33.20	–	4.7	North of Tuzgölü
8	19.04.1938	39.44	33.79	10	6.6	North of Kaman
9	19.04.1938	39.65	33.87	30	5.0	North of Kaman
10	24.04.1938	39.89	34.10	10	4.6	East of Kirikkale
11	14.05.1938	39.74	33.55	10	4.8	South of Kirikkale
12	14.05.1938	39.40	33.80	–	4.7	North of Kaman
13	28.05.1938	39.40	33.81	30	4.9	North of Kaman
14	21.07.1938	39.56	33.68	10	5.0	North of Kaman
15	16.12.1938	39.52	33.91	10	4.8	North of Kaman
16	21.02.1940	38.40	35.30	–	5.2	East of Yesilhisar (Kayseri)
17	13.04.1940	38.80	35.20	–	5.7	Northwest of Kayseri
18	30.07.1940	39.64	35.25	50	6.2	West of Sarikaya
19	31.07.1940	39.72	35.53	10	4.9	West of Akdagmadeni
20	3.08.1940	39.50	35.20	–	4.3	West of Sarikaya
21	1940	38.00	34.20	–	5.2	South of Tuzgölü
22	27.04.1941	39.68	35.31	60	5.7	South of Sorgun
23	21.08.1948	39.70	37.00	–	4.3	Sivas
24	3.10.1952	38.80	35.90	–	4.3	Bünyan
25	12.03.1960	39.40	36.40	–	4.5	Southwest of Sivas
26	31.08.1960	39.09	35.98	70	4.7	East of Tuzla lake
27	15.03.1961	39.10	34.20	–	4.9	Kirsehir
28	4.07.1978	39.45	33.19	23	4.5	North of Tuzgölü

[1]After Gencoglu et al., 1990.
[2]Day.month.year.
[3]Richter scale.

faults), (2) 040° to 050°, (3) 060° to 070° (oblique left-lateral strike-slip faults), and (4) 140° to 150° (normal faults with right-lateral strike-slip components) (Fig. 6D). This structural pattern reveals a compressive stress oriented at approximately 015°.

Interpretation of seismic data

The earthquake epicenters of events of magnitude 4.2 and greater in Central Anatolia for the period 1903–1986 are listed in Table 1. These data, hot springs, and Quaternary volcanic centers also have been plotted in Figure 3B. This map reveals that most of the earthquake epicenters, hot springs, and volcanic centers are concentrated along the major fault zones of Central Anatolia. Therefore, seismic activities and fault-parallel alignment of hot springs strongly suggest that most of the segments of the Tuzgölü fault zone, the Ecemis fault zone, and the Yozgat-Akdagmadeni-Bogazliyan fault system are still tectonically active.

Conclusions

The important geologic structures of Central Anatolia are: (1) NW-SE–trending right-lateral strike-slip faults with a normal slip component (Tuzgölü fault zone); (2) NE-SW–trending left-lateral strike-slip faults with a local normal slip component; (3) conjugate faults of the Yozgat-Akdagmadeni-Bogazliyan fault system; and (4) fault-controlled volcanic activities. The shape of the Sultansazligi and Tuzlagölü basins along the Ecemis fault zone, active border faults, volcanic activity, and seismicity all suggest that these two basins are active pull-apart basins that have been evolving since the early Quaternary. The presence of pull-apart basins also may reflect the effects of a transtensional regime in the eastern part of Central Anatolia.

Conjugate faults of the Yozgat-Akdagmadeni-Bogazliyan fault system may have been inherited from the final phase of the collisional tectonic regime, indicating NNE-SSW-directed compression that took place during the first stage of the paleotectonic regime. These structures were reactivated during the neotectonic regime that has operated since the late Miocene and is characterized by a strike-slip tectonic regime. As indicated by the recent character of earthquake activity, Central Anatolia remains tectonically active.

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